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(54) **MONOLITHIC 3D RADIAL POWER COMBINER AND SPLITTER**(75) Inventors: **David I. Stones; Alfred E. Lee**, both of Torrance, CA (US)(73) Assignee: **TRW Inc.**, Redondo Beach, CA (US)

(\*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(58) Field of Search ..... 333/125, 137, 333/26; 330/295

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(57) **ABSTRACT**

An SSPA module in accordance with the present invention comprises a signal input (102), and a radial splitter (100) connected to the signal input (102) comprising a plurality of radially extending splitter waveguides 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126. The SSPA module also includes a signal output (202), and a radial combiner (200) connected to the signal output (202) comprising a plurality of radially extending combiner waveguides 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226. Connections between the splitter (100) and combiner (200) are provided by a plurality of vertically extending waveguides 404, 406, 408, 410, 412, 414, 416, 418, 420, 422, 424, 426. The SSPA module also includes a plurality of processing circuits 304, 308, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, for example MMIC amplifiers, connected to the combiner waveguides 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226. A waveguide to microstrip transition (510) may also be used to connect signals propagating in the waveguides to and from microstrip lines connected to the processing circuitry (304–326). Generally, the transition (510) includes a waveguide section (512) with a top conducting layer (516) that defines a first slit (526) and a second slit (528) bounding a transition area (530) abutting a microstrip section (514) to form a waveguide to microstrip transition.

**26 Claims, 4 Drawing Sheets**